REMARKS:

Claims 1 and 14-23 are rejected under 35 U.S.C. 103(a) as being unpatenable over U.S. Patent 6,262,704 to Kurumisawa in view of U.S. Patent 5,764,225 to Koshobu. The rejection is traversed is so far as it is applied to the claims as amended.

Claim 1 has been amended to incorporate the limitations of Claim 12 and Claim 12 has therefore been cancelled. As amended, it is believed that Claim 1 is not taught or suggested by Kurumisawa and Koshobu, either individually or in combination. Claim 1 contains the limitation that a circuit comprising an energy storage device supplies electrical potentials to row and column electrodes to cause the display to display desired images. The storage devices are charged by one of the power sources during a portion of at least one field addressing cycle and used to supply electrical potentials to a row or column electrode in a different portion of such field addressing cycle. The devices are charged for a fraction of such different portion, when the storage devices are used to supply electrical potentials to a row or column electrode, to compensate for charge consummation. This aspect of the invention is illustrated by the embodiment described in the specification on page 12, especially page 12, lines 16-22, and in Fig. 4c. As explained in such section of the specification, the embodiment reduces the capacitance requirement for driving the row and column electrodes without causing significant errors in driving the electrodes to the target potentials. rationale

Thus, the at least one field addressing cycle may be divided into at least two portions. During one portion of the cycle the energy storage devices are charged. In the embodiments of Figs. 4a-4c and described on page 12 of the specification, the capacitors CB+, CB- are employed. During one portion of the field addressing cycle, the two capacitors are charged, when switch signal F2b is high and switch signal F1b is low. During another portion of the cycle, the two capacitors are used to supply electrical potentials to the column electrodes, when the switch signal F2b is low but the switch signal F1b is high. The use of the charges and energy stored in the two capacitors would decrease during the phase when the capacitors are used to supply charges and energy to the column electrodes. Therefore, unless the two capacitors have capacitances much higher than the product of the sum of the pixel capacitance and the maximum number of

column electrode transitions, the two capacitors may not be capable of driving the column electrodes to the target potentials. According to the embodiments of this aspect of the invention, "recharge pulses" as illustrated in Fig. 4c are inserted during the portion of the field addressing cycle when the switch signal F2b is low (that is during the portion of the cycle when the two capacitors are used to supply energy and electrical potentials to the column electrodes). While the above feature of Claim 1 is illustrated by the above described embodiment, it will be understood that such embodiment is merely some implementation of the claim feature. The scope of Claim 1 is not limited to that of the embodiment.

From the above, it is evident that neither Kurumisawa nor Koshobu teaches or suggests the above described claim feature, either individually or in combination. In the middle of page 3 of the Office Action, the examiner is of the opinion that Kurumisawa teaches a feature rendering Claim 12 unpatentable, referring to Figure 34A at 710, 720, Li, Si. We respectfully disagree. Figure 34 A at 710, 720, Li, Si do not teach or suggest the feature of Claim 12 (now incorporated in amended Claim 1, and illustrated in the embodiment above) at all. If the examiner disagrees, it is respectfully requested that the examiner explain in detail, referring to specific column and line numbers and figures in Kurumisawa, with full explanation rather than conclusory statements, to support the examiner's conclusion that Claim 12 is obvious in view of Kurumisawa and Koshobu.

Furthermore, Claim 1 contains the limitation that at least one of the electrical potentials supplied to the row and column electrodes changes with a voltage supplied or caused to be supplied by one of the power sources. This is not taught or suggested by either Kurumisawa or Koshobu. In rejecting Claim 1, the examiner points to column 20, lines 55-63 and column 21, lines 21-28 of Kurumisawa referring to figures 34A and 34B. Such section of Kurumisawa, however, merely indicates that either the scanning lines (i.e. row electrodes) or the data lines (i.e. column electrodes) are set to electronically floating states to turn the screen to the off state (the high-impedence state). In other words, the lines would be at indeterminate voltages and do not change with any voltage supplied by another source. This is very different from the claim feature in Claim 1. In Claim 1, at least one of the electrical potentials supplied to the row and column electrodes changes with the voltage supplied or caused to be supplied by one of the power sources to

a definite voltage and is not indeterminate. In the embodiment of Fig. 4a, for example, when the switching signal F2b is high, the capacitors CB+ and CB- are charged to the respective potentials V3, V2 and V1. When the switch signal F1b is high, the terminal CB-b of capacitor CB- is connected to the switch I31. But since the terminal CB+t is then connected to the electrical potential V6, this has the effect of causing the electrical potential at the terminal CB-b to change with (e.g. be pulled by) the potential V6 to the value V4 appearing at the switch I31 to supply to the column electrodes. While useful for illustrating the claim feature of Claim 1, it should be noted that the claimed feature is not limited to the implementation of such embodiment just described.

In contrast, in Kurumisawa, the scanning lines and data lines are merely floating so that their voltages do not follow or change with any other potential, since these lines are left in the display-off state, which is a high impedience state. This is very different and has nothing to do with the claimed feature where the electrical potential supplied to the electrodes changes with another voltage supplied or caused to be supplied by one of the power sources. Such deficiency is not remedied by Koshobu which also fails to teach or suggest such feature. This feature has nothing to do with reducing flicker referred to by the examiner. The examiner has failed to explain or cite any factual support for the position that Kurumisawa and Koshobu, either individually or in combination, teaches or suggests the above described feature of claim 1.

Based on the above, it is believed that Claim 1 is patentable over Kurumisawa and Koshobu and all other art of record.

Claim 14 contains the limitation that one or more of the power sources drives the row electrodes through a first voltage ranges, and drives the column electrodes through a second voltage range. The first voltage range changes over different field addressing cycles. The second voltage range changes with the first voltage range when the first voltage range changes and with at least the voltage generated or caused to be generated by one of the power sources. Such feature is illustrated in the embodiment of Fig. 4a. First when the switch signal F2b is high, electrical potentials V6 and V2 are supplied to the switches S+ and S- for driving the row electrodes through a first voltage range (V2 <=> V6). The electrical potentials V3 and V1 are supplied to the switches I32 and I31 respectively for driving the column electrodes through a second voltage range (V3 <=>

V1). This is the case during one field addressing cycle when the switch signal F2b is high. During a different field addressing cycle when the switch signal F2b is low but the signal F1b is high, the first voltage range supplied to the switches S+ and S– is changed to V5 and V1 (i.e.V1 <=> V5) respectively. When this happens, and as described as above, the terminal CB-b is pulled to V4 by the potential V6, so that the second voltage range changes with the first voltage range and with a voltage supplied by a power source as a result. Again, while such implementation is useful to illustrate the claimed feature in claim 14, the scope of Claim 14 is not limited to the implementation of the embodiment of Fig. 4a.

The above described feature of Claim 14 is not taught or suggested by Kurumisawa and Koshobu, either individually or in combination. If the examiner disagrees, it is respectfully requested that the examiner explain in detail, pointing to specific sections of the references and explaining in detail why such sections teach or suggest the above described claimed feature of Claim 14.

The reasons given by the examiner for the rejection of claims 13, 15-17 and 19-21 fail to address and appear to have little to do with the specific limitations in these claims. If the examiner disagrees, it is respectfully requested that the examiner explain in detail, pointing to specific sections of the references and explaining in detail why such sections teach or suggest the limitations in these claims.

Claims 15-22 are believed to be allowable since they depend from allowable Claim 14; they are further believed to be allowable because of the limitations added in these claims. Thus Claim 15 adds the limitation that the first voltage range is between a non-scanning voltage value and the scanning voltage value and the second voltage range changes with the non-scanning value. Claim 16 adds the limitation that the second power source comprises a pair of capacitors and the apparatus further comprises a switching circuit connecting the capacitors to cause the second voltage range to change about the non-scanning value. Claim 17 adds the limitation that the pair of capacitors are connected in a voltage divider configuration separating three nodes, wherein the switching circuit causes one of the nodes in between the pair to be at the non-scanning voltage of the first voltage range in at least one field addressing cycle. Claim 18 adds the feature that a switching circuit causes voltages at one of the two remaining nodes to be

supplied to a column electrode during at least one field addressing cycle. Claim 19 adds a feature similar to that explained above in Claim 1 (and cancelled Claim 12).

Claim 20 adds the limitation that the column electrodes are substantially disconnected from column drivers during the fraction of a portion of the addressing cycle when the capacitors are charged so that a desired image is displayed at pixels covered by the column electrodes that are substantially disconnected from the column drivers. As noted on page 12, lines 23-29 of the application, in one embodiment, when the column electrodes are so disconnected, the intrinsic capacitance of the liquid display itself performs as the holding capacitor until the capacitors are reconnected to them. This is different from Kurumisawa since, in claim 20, images are displayed so that a desired image is displayed at pixels covered by column electrodes that are so disconnected.

Claim 21 adds the feature that the first and second power sources supply only electrical potentials that are higher or lower than a referenced potential of the substrate. Claim 22 contains the feature that the charge from the column electrode during one column addressing cycle is stored in a capacitor and is then re-used to be applied to a column electrode in a subsequent column addressing cycle. This is described under the heading "Current Reuse" on pages 9 and 10 of the specification. None of these features is taught or suggested by Kurumisawa, Koshobu or any other art of record.

Claims 23 and 24 have been cancelled without prejudice so that claims of similar scope may be re-presented in related applications. As for Claims 13, 15-17, and 19-21, the examiner is of the opinion that these claims are obvious in view of Kurumisawa, referring to Figure 34A and 710, 720, Li, Si. Such figure of Kurumisawa clearly fails to teach or suggest Claims 13, 15-17 and 19-21. The examiner has failed to explain why Figure 34A of Kurumisawa teaches or suggests such features. If this rejection is to be maintained, it is respectfully requested that examiner explain in detail how Figure 34 of Kurumisawa teaches or suggests such claims.

The examiner is of the opinion that Claims 18 and 22 are taught by Koshobu referring to column 4, lines 20-30 and Figure 1 at 70, 80. We respectfully disagree. Column 4, lines 20-30 and Figure 1 at 70, 80 of Koshobu apparently have nothing to do with the above-explained claim features of Claims 18 and 22. The examiner has failed to explain how such section and figure can be applied to claims 18 and 22. For example,

claim 18 contains the feature that "the switching circuit causes voltages at one of the two remaining nodes to be supplied to a a column electrode during at least one field addressing cycle." The sections of Koshobu and Kurumisawa relied on by the examiner simply fail to teach anything resembling such feature. The examiner is requested to explain in detail why such section and figure teach or suggest Claims 18 and 22. Nor is the deficiency remedied by Kurumisawa in column 3, lines 33-55, contrary to statement in the office action on page 4, lines 7-8, since neither Koshobu or Kurumisawa teaches or suggests a voltage divider configuration separating three nodes with the voltage at one of the nodes applied to a column electrode as in Claim 18. None of these sections of Koshobu and Kurumisawa teaches anything resembling the feature of current re-use of Claim 22.

Claims 2-11, and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kurumisawa in view of Koshobu and further in view of U.S. Patent 4,802,739 to Iwamoto. The rejection is respectfully traversed.

The above-described deficiencies of Kurumisawa and Koshobu are not remedied by Iwamoto. Therefore, Claims 2-11 are believed to be allowable since they depend from allowable Claim 1. They are further believed to be allowable since they add features that are not taught or suggested by any art of record, including Iwamoto. First, Claims 2 and 3 add more specific features relating to how at least one of the electrical potentials supplied by at least one energy storage device changes with a voltage supplied or caused to be supplied by one of the power sources. The same may be said for Claim 8. Claim 9 adds the feature that the control device causes the two energy storage devices to be connected in parallel so that they are charged with substantially the same voltage across the terminals. This is not taught or suggested by Iwamoto, since at no time are the two capacitors C1 and C2 in Iwamoto charged when they are connected in parallel. Claim 10 contains the feature that a control device causes the two energy devices to be connected in series during charging. This is not taught or suggested by Iwamoto either since the two capacitors C1 and C2 of Iwamoto are not connected in series during charging in Iwamoto. If the examiner disagrees, it is respectfully requested that the examiner explain in detail why in his view, Iwamoto teaches such features.

Regarding Claims 6, 7 and 11, the examiner refers to column 4, line 20-30, Figure 1 at 70, 80 of Koshobu and column 3, lines 33-55 of Kurumisawa. Claims 6 adds the limitation that at least two power sources supply respectively a first and a second voltage and a common reference voltage. The difference between the second and the reference voltages defines a voltage differential. The control device comprises a first set of switches that causes a set of voltages to be generated that are above the reference voltage or below the first voltage by an integer multiple of the voltage differential. The referenced sections of Koshobu and Kurumisawa simply fail to teach or suggest such feature. Claim 11 adds the feature that the electrical potentials supplied by the circuit to the row electrodes are of a predetermined amplitude above a reference voltage in some field addressing cycle and of the predetermined amplitude below the reference voltage in other field addressing cycles. The electrical potentials supplied by the circuit have a dynamic range substantially equal to the amplitude. The referenced sections of Koshobu and Kurumisawa similarly fail to teach or suggest such feature. If the examiner disagrees, it is respectfully requested that the examiner explain in detail how the reference sections of Koshobu and Kurumisawa teach or suggest such features of Claims 6 and 11.

Claims 25-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kurumisawa in view of Iwamoto. The rejection is respectfully traversed.

Claim 25 has been amended to incorporate the limitations of Claims 30 and Claim 30 has now been cancelled. As amended, Claim 25 includes a limitation that a power supply and at least one column electrode are connected to a first and a second electrical energy storage device. In one row scanning cycle, the first device is connected to the power supply to charge the first device and the second device is connected to at least one column electrode to apply to it an electrical potential. In another row scanning cycle, the second device is connected to the power supply to charge the second device and the first device is connected to at least one column electrode to apply to it an electrical potential. The power supply and at least one column electrode are connected to the two energy storage devices according to a switching timing waveform that is delayed relative to the row scanning cycles so that at least one of the energy storage devices is connected to at least one column electrode during a portion of a row scanning cycle, and the remaining

energy storage device is connected to at least one column electrode during another portion of such row scanning cycle.

The above claimed feature is illustrated in the embodiment of Figs. 6a and Figs. 6b and in the specification, page 18, line 29-page 23, line 2. Such features solve the problem described on page 19, lines 4-24 of the specification. To summarize the problem outlined in the specification, where energy storage devices such as capacitors are used to drive column electrodes to target voltage values, the accuracy at which these target values can be accomplished depends on the capacitance of the driving capacitor relative to the load capacitance of the column electrode that is driven. In one example, if the capacitance of the driving capacitor is twenty times that of the load capacitance at the column electrode, the capacitor can drive the column electrode to within 5% of the target voltage value. The feature of Claim 25 allows the column electrode to be driven to a voltage value very close to the target voltage value without using a driving capacitor having a capacitance which is much larger than that of the column electrode. In one embodiment as described in the above referenced section of the specification, this is accomplished by using a switching/timing waveform (such as one illustrated in Fig. 6b) that is delayed related to row scanning cycles so that at least one of the energy storage devices is connected to the column electrode during a portion of a row scanning cycle and the other energy storage devices is connected to the same column electrode during another portion of the same row scanning cycle. Such feature is clearly not taught or suggest by either Kurumisawa or Iwamoto, including the sections of Kurumisawa and Iwamoto referenced on pages 6 and 7 of the Office Action. If the examiner disagrees, it is respectfully requested that the examiner explain in detail, referring to specific column and line numbers and figures in Kurumisawa and Iwamoto, with appropriate explanation rather than conclusory statements, to support the examiner's conclusion.

Claims 26-29, 31 and 32 are believed to be allowable since they depend from allowable Claim 25; they are further believed to be allowable because of the limitations added in these claims. Thus Claim 26 adds the limitation that at least one of the electrical potentials supplied to the row and column electrodes changes with a voltage supplied by a power source. For the same reasons as those discussed above for claim 1, such

limitation is not taught or suggested by any art of record. Claim 27 adds a similar limitation. Claims 31 and 32 are discussed below together with claims 34 and 35.

The feature of Claim 33 is also illustrated in Figs. 6a, 6b, and in the specification page 18, line 29 through page 23, line 2. In such feature, two energy storage devices are used to drive the voltage of the same column electrode. The first energy storage device drives the column electrode to close to a target value during a beginning portion of a row scanning cycle and the second energy device drives the same column electrode to substantially the target value during such row scanning cycle, but after the beginning portion of such cycle. This would also accomplish the goal of driving the column electrode to substantially the target value without using capacitors having huge capacitances. Such features are clearly not taught or suggested by either Kurumisawa or Iwamoto.

Claims 31, 32, 34, and 35 are believed to be allowable since they come from allowable Claims 25 and 33; they are further believed to be allowable since they contain limitations which are not taught or suggested by any other record. Thus, 31 and 34 contain the limitation that a major portion of the energy of the first storage device is transferred to the column electrode during a beginning portion of the row scanning cycle and a minor portion of the energy of the second energy storage device is transferred to the same electrode during such row scanning cycle but after the beginning portion. Claims 32 and 35 add the limitation that both the first and second energy storage devices are connected to the same column electrode during a portion of the row scanning cycle. For reasons substantially similar to those explained above for claims 33-35, claims 43-45 are likewise believed to be allowable.

Claim 36 has been amended to incorporate the limitation of claim 40 and claim 40 has therefore been cancelled. For reasons substantially similar to those explained above for Claims 25-29, 31, 32, Claims 36-39 and 41, 42 are likewise believed to be allowable.

Claims 46-48 have been added to more completely cover the invention.

Claims 1-11, 13-22, 25-29, 31-39, and 41-48 are presently pending in the application. Reconsideration of the rejections is respectfully requested and an early indication of the allowability of all the claims is earnestly solicited.

Respectfully submitted,

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